

# **Comparison of Vascular Plant Species Richness and Vertebrate Species Richness in National Parks of the Eastern United States**

Kaci E. Myrick<sup>1</sup>, Michael Huston<sup>1</sup>, Jeff S. Hatfield<sup>2</sup>,  
Floyd W. Weckerly<sup>1</sup>, and M. Clay Green<sup>1</sup>

<sup>1</sup>Texas State University, San Marcos, Texas

<sup>2</sup>USGS Patuxent Wildlife Research Center, Laurel, Maryland

# Acknowledgements

## Funding:

- U.S. Geological Survey
- National Park Service
- Natural Resource Preservation Program (NRPP)

## Significant assistance:

- Dr. Diane Pavek, NPS
- Dr. Larissa Bailey, USGS
- Geoff Sanders, NPS

# Species Richness

= Number of Species



Photo by Wilma Keidel

# Surrogates

- Significant broad correlations
  - Known species groups correlated to less well known groups
- Might be more convenient to...
  - Monitor one species group in particular if it is highly correlated with other groups

# Plants vs. Vertebrates



=



?

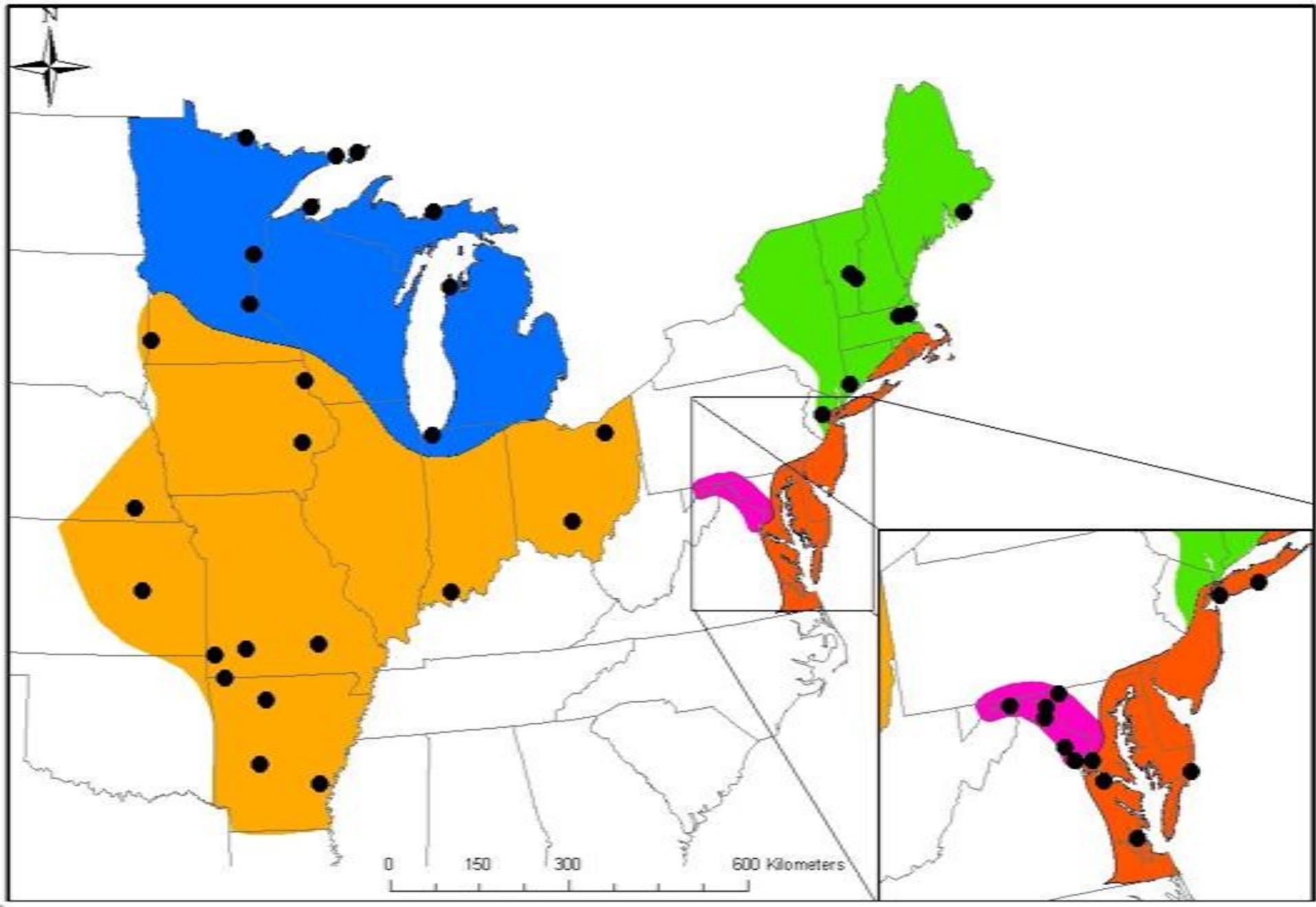
# The Data



- Natural Resource Challenge
- Inventory and Monitoring (I & M) Program

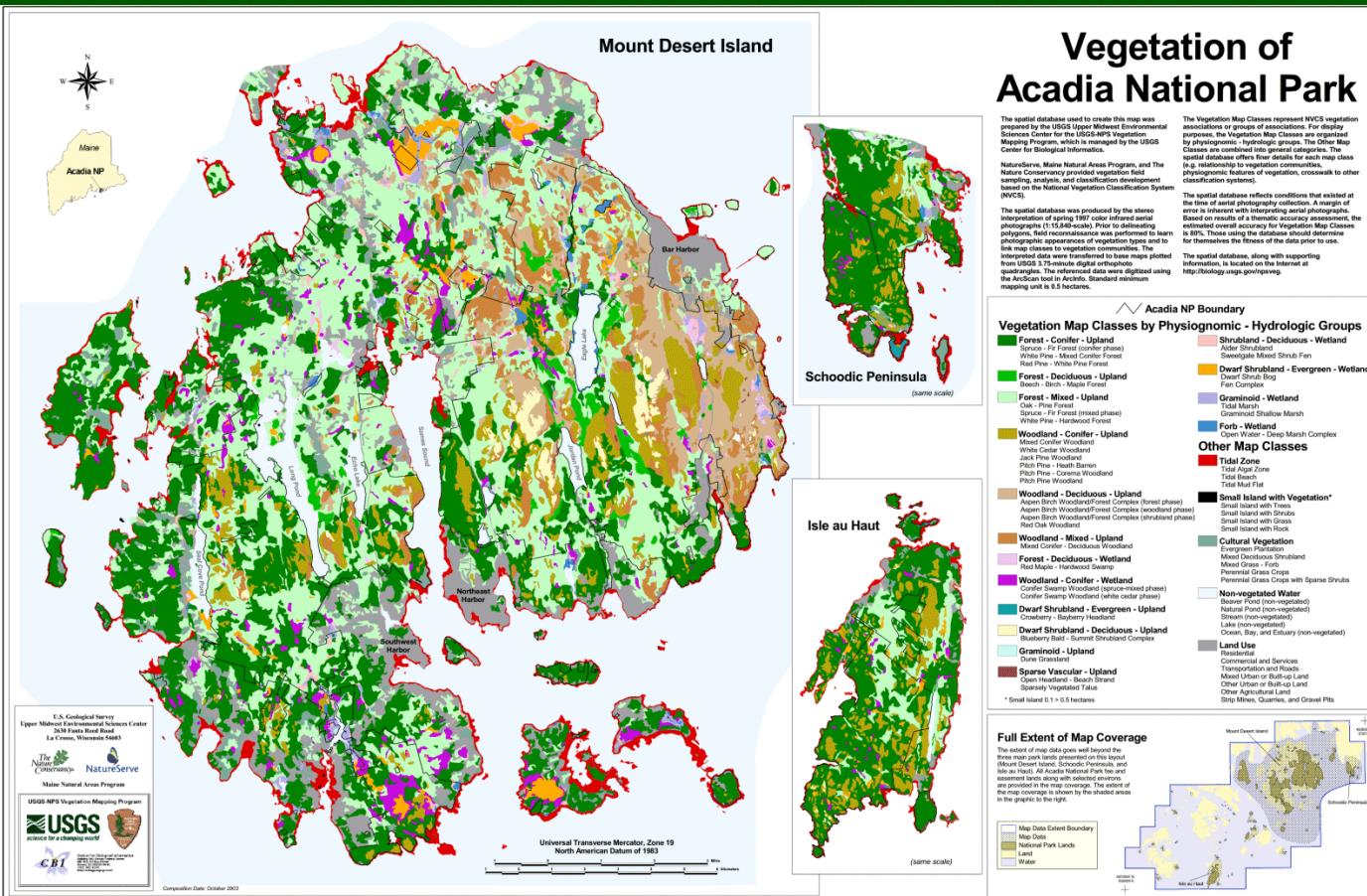
# I & M

- Goal of “preserving natural resources”
- 90% of plant and animal species on NPS owned land
- NPSpecies database (“certified data”)



# Additional Variables

- Habitat Heterogeneity



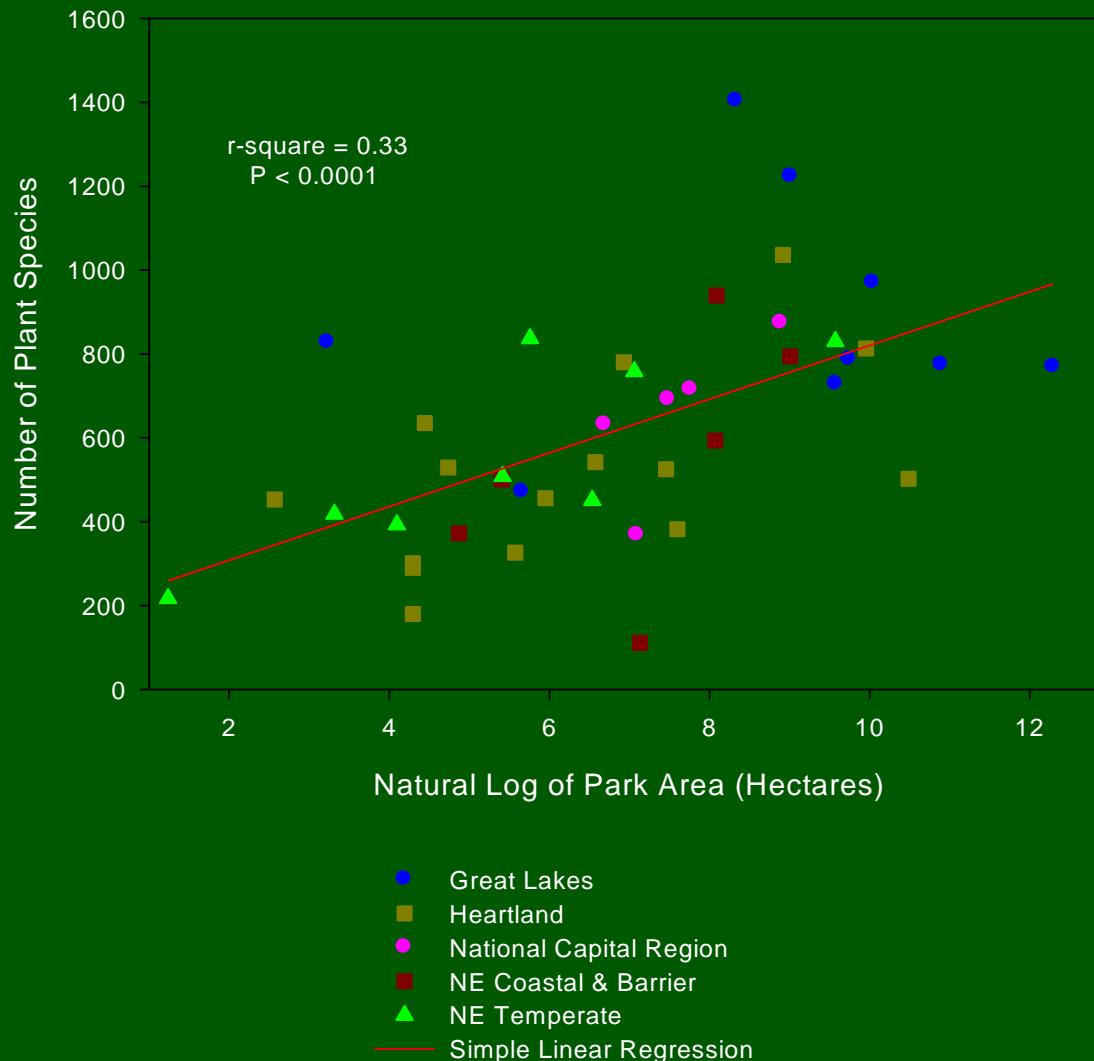
# Additional Variables

- Total park area
- Latitude
  - [www.nationalatlas.gov](http://www.nationalatlas.gov)
- Mean Annual Temperature and Precipitation
  - NOAA National Climatic Data Center (1961-1990)

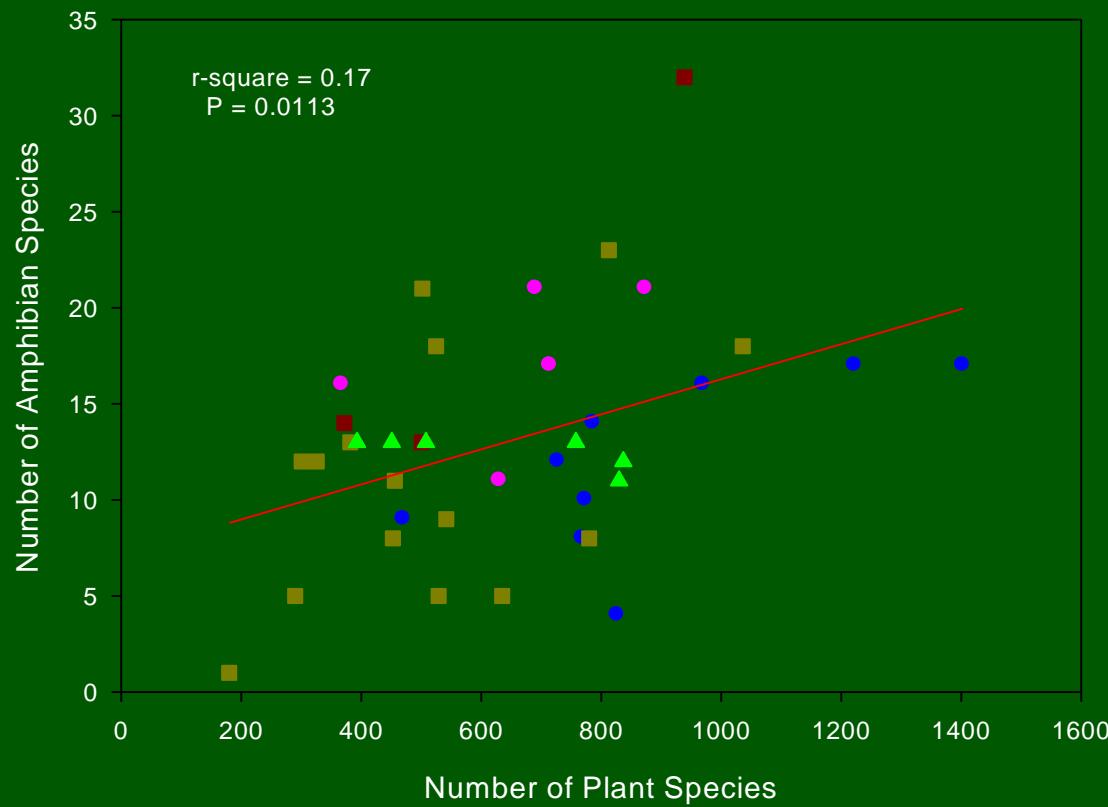
# Statistical Analyses

- Simple Linear Regression (SLR)
  - Each of 4 vertebrate groups vs. plants
  - Also each group vs. natural log of area and other variables
- Multiple Regression (MR)
  - Includes most variables together, separate for each species group
- Analysis of Covariance (ANCOVA)
  - Tests for network effects

# Plant Species Richness vs. Log of Park Area

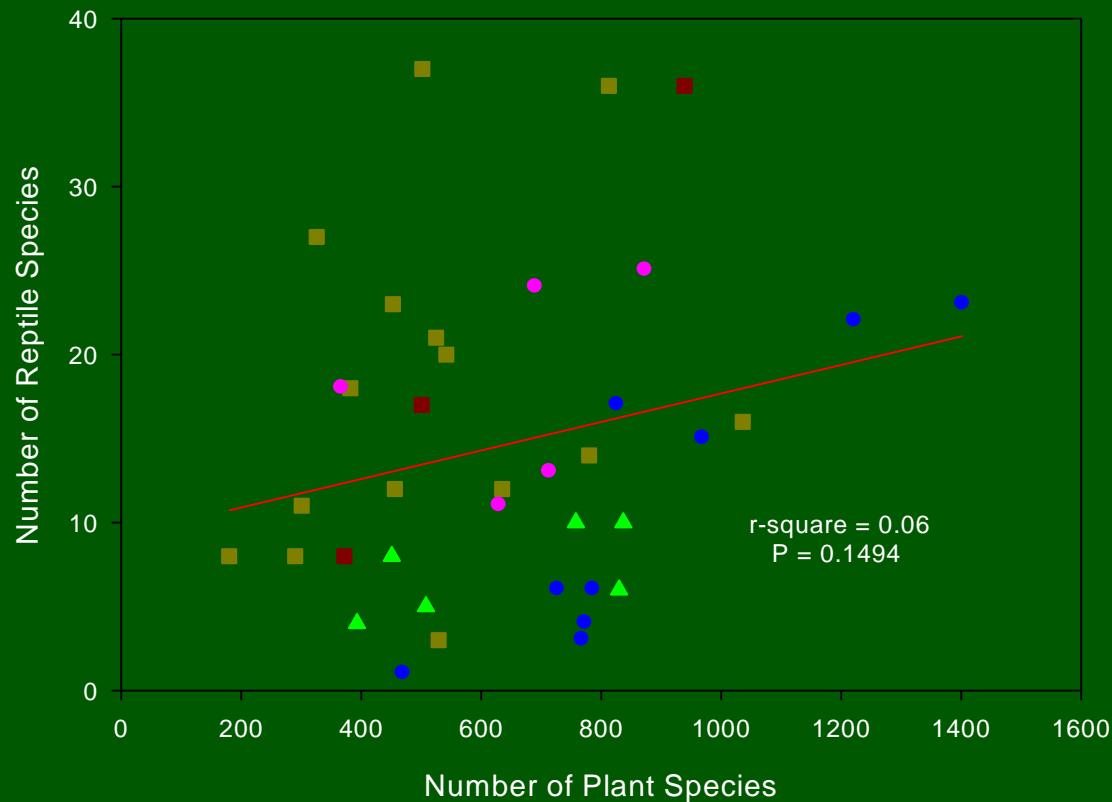


# Amphibian vs. Plant Species Richness



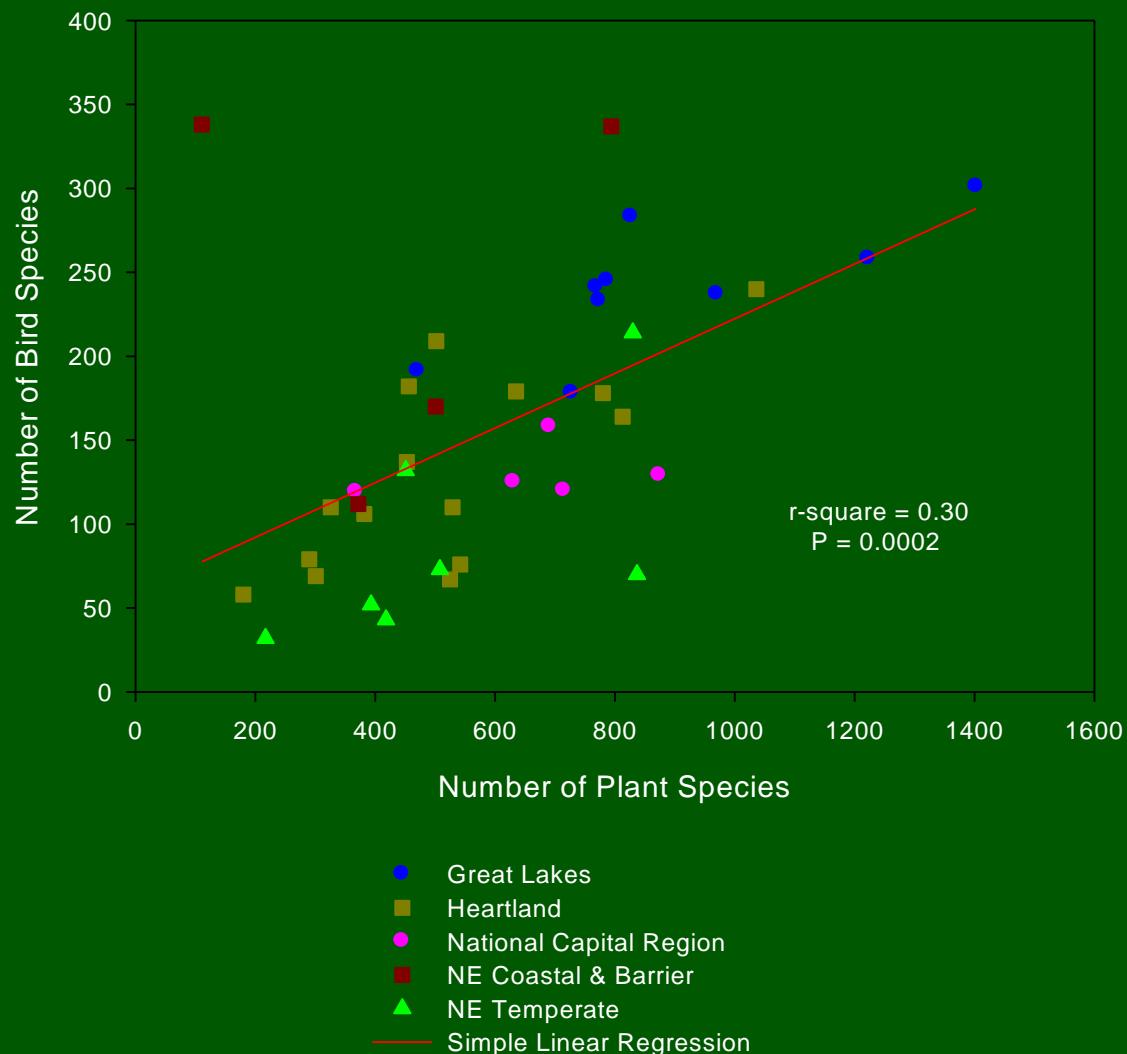
- Great Lakes
- Heartland
- National Capital Region
- NE Coastal & Barrier
- ▲ NE Temperate
- Simple Linear Regression

# Reptile vs. Plant Species Richness

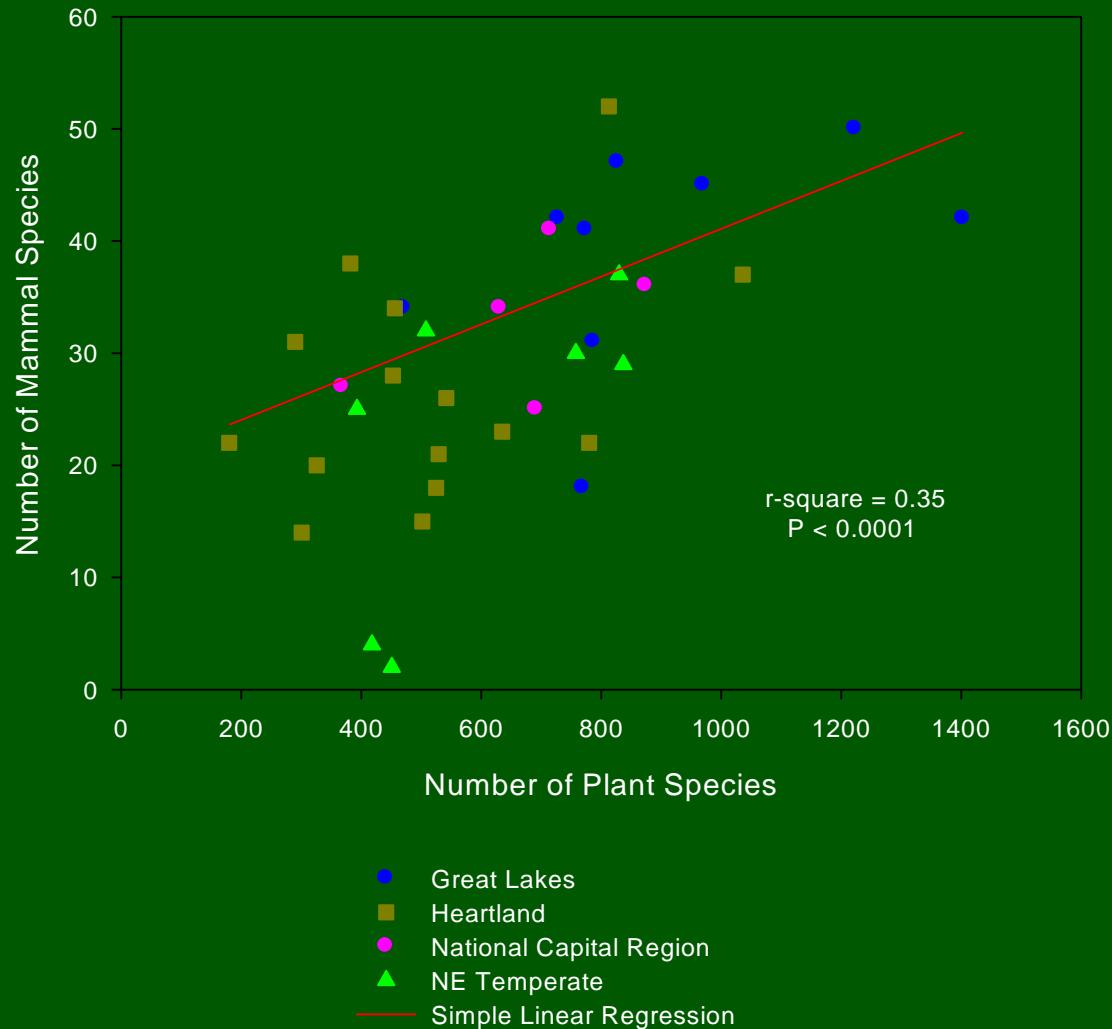


- Great Lakes
- Heartland
- National Capital Region
- NE Coastal & Barrier
- ▲ NE Temperate
- Simple Linear Regression

# Bird vs. Plant Species Richness



# Mammal vs. Plant Species Richness



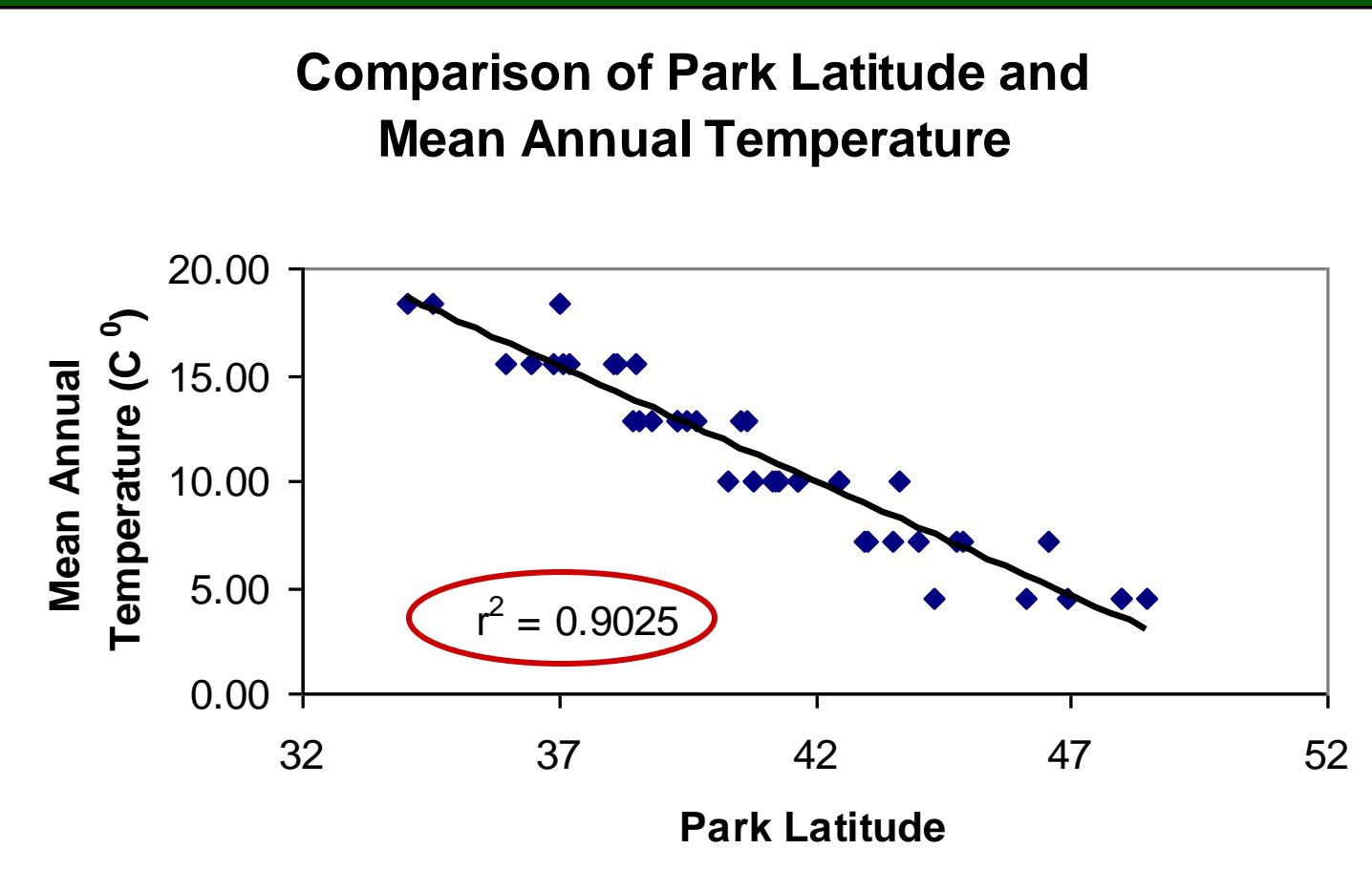
# Summary of SLRs

	Plants	log of Park Area	Latitude	Temp. & Precip.
Plants	X	*	*	*
Amphibians	*	*	*	
Reptiles			*	*
Birds	*	*	*	
Mammals	*	*		

\* =  $p < 0.05$

# Multiple Regressions

-Temperature not analyzed



# Summary of Multiple Regressions

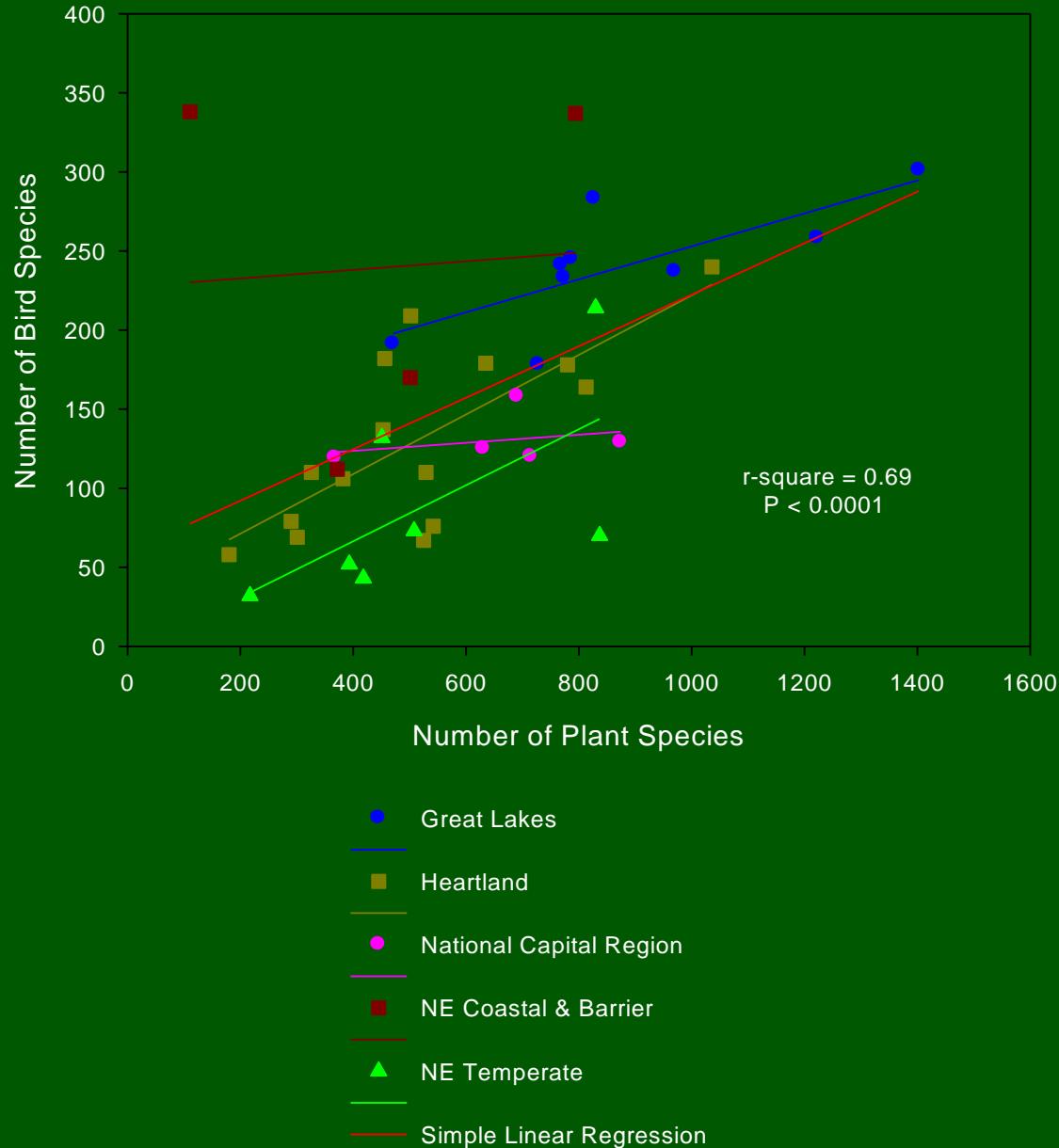
	Adjusted $r^2$	Plants	log of Park Area	Latitude	Precipitation
Plants	0.33*	X	*		
Amphibians	0.49*	*	*	*	
Reptiles	0.71*	*		*	*
Birds	0.36*		*		
Mammals	0.37*	*			

\* =  $p < 0.05$

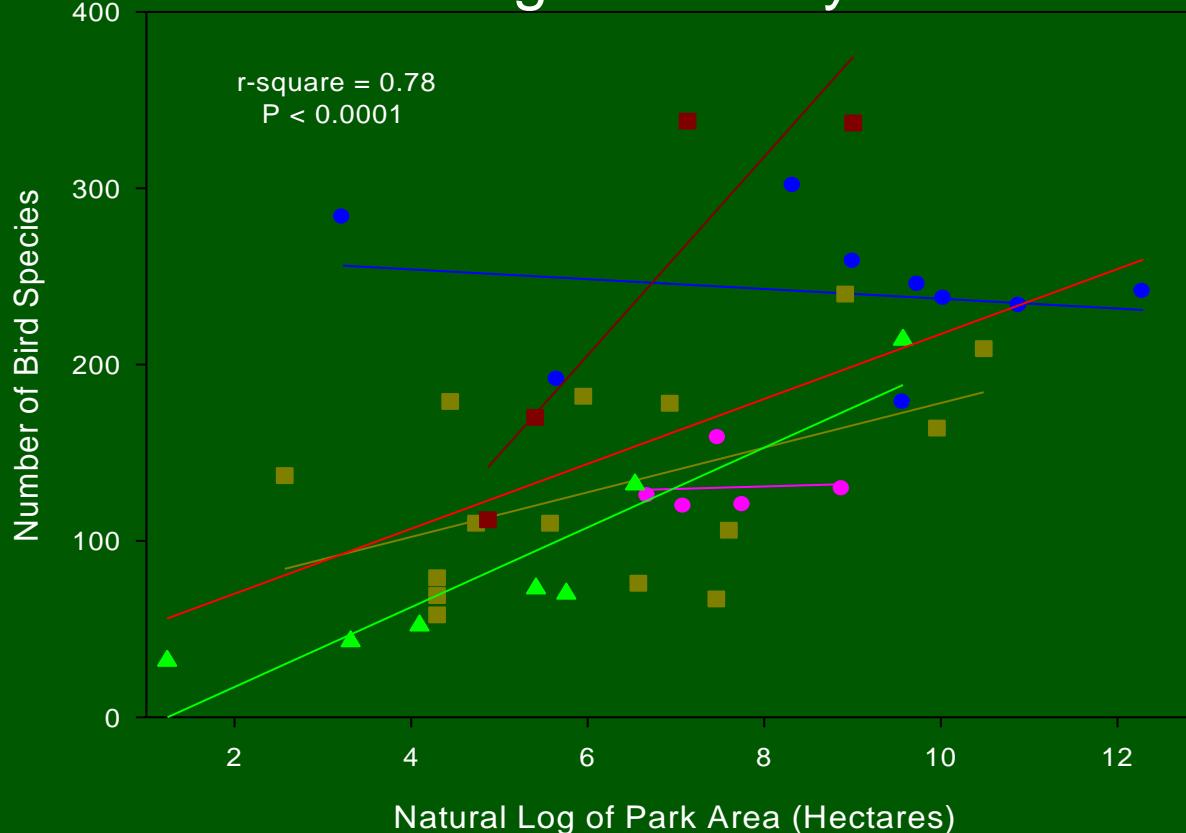
# Analysis of Covariance (ANCOVA)

- Fits separate regression line to each network and tests whether the lines are significantly different among networks
- If different, this implies that perhaps networks should not be pooled together
- For example, for birds, the relationship between bird vs. plant species richness and birds vs. log of area is significantly different among networks:

# Bird vs. Plant Species Richness by Network



# Birds vs. log of Area by Network



# Conclusions

- Plants do predict vertebrates
- Differences among NPS networks
- Surrogates?